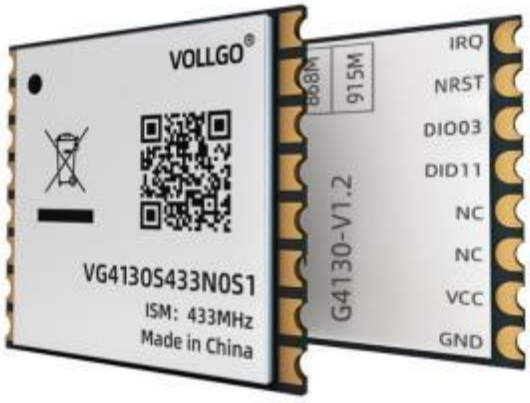
VG4130SxxxN0S1 wireless module

Hardware specification

V1.0



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1. Overview

VG4130SxxxN0S1 series of wireless modules,based on PANCHIP of PAN3029 High-performance wireless transceiver chip design,It is a small size, low power consumption, Long-distance two-way wireless transceiver module. PAN3029 is a product that adopts Chirp-IOT A low-power long-distance wireless transceiver chip with modem technology, supporting half-duplex wireless communication, and the working frequency band is 408 ~ 565MHz/816 ~ 1080MHz. This chip has the characteristics of high anti-interference, high sensitivity, low power consumption and ultra-long distance.sex.

This series of modules integrates all radio frequency related functions and devices, Users do not need to have an in-depth understanding of RF circuit design, they can use the module to easily Develop wireless solutions and wireless IoT devices with stable performance and high reliability .

Product main features:

- Chirp-IOT modulation
- The maximum link budget can be reached 164dB
- Maximum transmit power 20dBm, programmable configuration
- High receiving sensitivity: -143dBm @SF=12, BW=62.5kHz, LDO model
- Wide operating voltage range: 1.8～3.6V
- Support bandwidth 62.5kHz, 125kHz, 250kHz, 500kHz
- Support spreading factor SF: 5～12

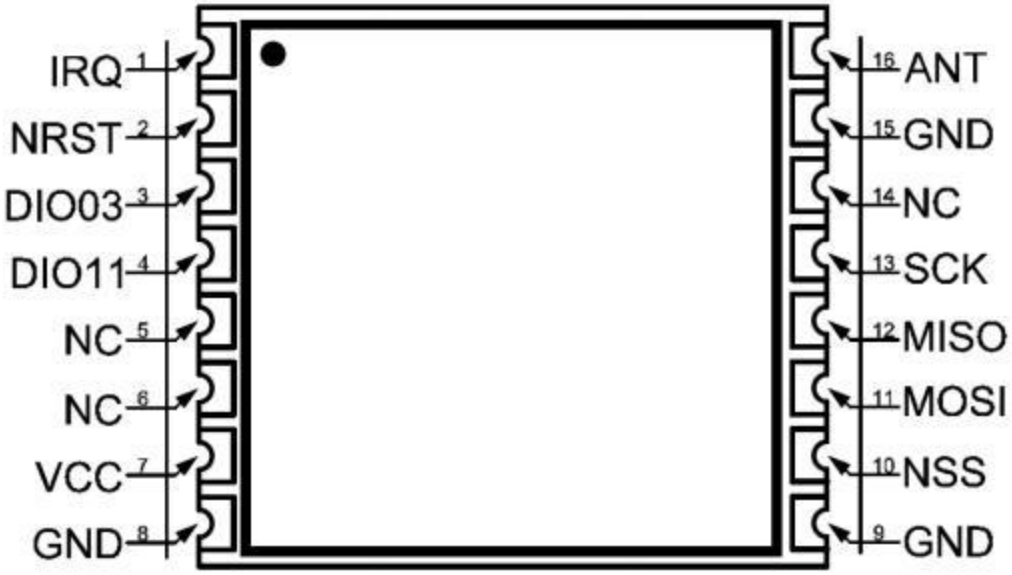
application:

- smart meter
- Supply chain and logistics
- Building automation
- agricultural sensors
- Smart City
- retail store sensors
- Asset tracking
- security system
- Remote control application

2.Technical Parameters

Technical indicators	parameter	Remark
voltage range	1.8～3.6V	generally 3.3V
Working frequency	433MHz, 490MHz, 868MHz, 915MHz	The applicable frequency band is determined by the module model
Crystal frequency	32MHz	Passive crystal oscillator
Output Power	-30dBm to +20dBm	Programmable configuration
Wireless speed	0.08kbps～59.9kbps	Programmable configuration
Modulation	Chirp-IOT	
Receive sensitivity	-143dBm	SF=12,BW=62.5kHz, LDO model
Receive bandwidth	62.5Khz, 125KHz, 250KHz , 500KHz	Programmable configuration
Emission current	100mA	Transmit power: 20dBm
receive current	4.2mA@DC-DC model 8mA @LDO model	
Sleep current	200nA	Deep sleep model
Driver interface	SPI	maximum speed 10MHz
Antenna impedance	50 ohm	
Antenna connection method	Side stamp hole	
storage temperature	-55℃~+125℃	
Operating temperature	-40℃~+85℃	Industrial grade
Size	13.5x12.0x2.2mm	wxya

3. Pin location diagram



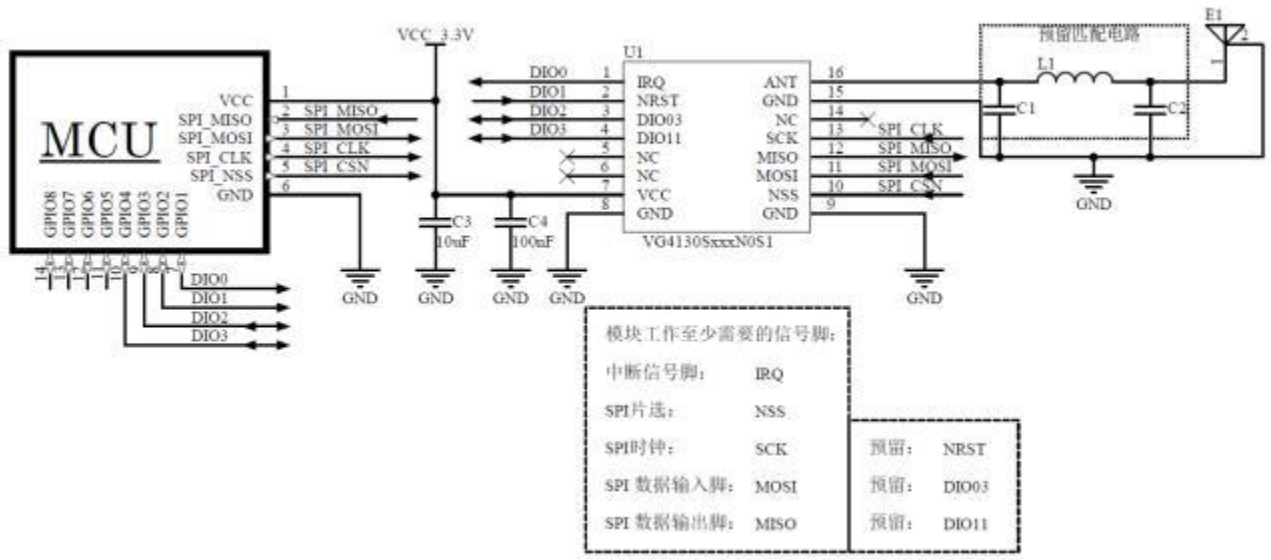
picture 3-1 top view

4. Pin description

number	pin	type	describe
1	IRQ	O	Interrupt signal pin
2	NRST	I	Hardware reset pin, active low level
3	DIO03	I/O	number IO, software configurable, directly connected to the chip GPIO3
4	DIO11	I/O	number IO, software configurable, directly connected to the chip GPIO11
5	NC	--	The module is floating inside
6	NC	--	The module is floating inside
7	VCC	power supply	Positive pole of power supply
8	GND	power supply	land
9	GND	power supply	land
10	NSS	I	SPI Interface chip select input
11	MOSI	I	SPI interface MOSI data input
12	MISO	O	SPI interface MISO data output
13	SCK	I	SPI Interface clock input
14	NC	--	The module is floating inside
15	GND	power supply	land
16	ANT	I/O	RF signal input/output, catch 50Ω antenna

5. Hardware design guidance and precautions

5.1. Hardware connection diagram



picture 5-1 Programming Development Hardware Connection

5.2. Power supply design and related precautions

1. Please pay attention to the correct connection of the positive and negative poles of the power supply, and ensure that the power supply voltage is within the recommended supply voltage range. If it exceeds the maximum allowable power supply range of the module, it will cause Otherwise the module will be permanently damaged; the filter capacitor of the module power pin should be as close as possible to the module power pin.

2. In the module power supply system, excessive ripples may be coupled to lines susceptible to interference through wires or ground planes, such as antennas, feeders, and clocks.lines and other sensitive signal lines, It is easy to cause the RF performance of the module to deteriorate, so we recommend using LDO as the power supply for the wireless module.

3. Select LDO When installing a voltage stabilizing chip, you need to pay attention to the heat dissipation of the power supply and LDO Stable output current driving capability; considering the long-term stable operation of the whole machine, it is recommended Recommended reservation More than 50% current output margin.

4. It is best to use one module separately LDO Stabilized power supply; if using DC-DC power supply chip, be sure to add one at the end LDO As isolation of the module power supply,Prevent the noise of the switching power supply chip from interfering with the working performance of the radio frequency.

5. MCU If the communication line between the module and the module is used 5V level, must be connected in series 1K-5.1K Resistor (not recommended, still risk of damage).

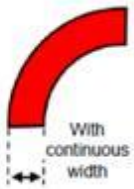
6. Keep the RF module as far away from high-voltage devices as possible, because the electromagnetic waves of high-voltage devices will also have a certain impact on RF signals.

7. High-frequency digital traces, high-frequency analog traces, and high-current power traces should be kept away from the bottom of the module as much as possible. If they must pass under the module, the traces must be routed.Put the module PCB Another layer of the bottom board, and ensure that the copper underneath the module is well grounded.

5.3. Antenna design and guidance

5.3.1 stamp hole interfaceRF design

When selecting the module RF output interface to be in the form of a stamp hole, Use 50ohm characteristic impedance traces to connect the bottom board during designAntenna on PCB. Considering the attenuation of high-frequency signals, attention needs to be paid to the bottom plate PCB The length of RF traces must be as short as possible. It is recommended that the longest trace length does not exceed 20mm, and route The width needs to be continuous; try not to make sharp or right angles when turning. It is recommended to take the arc line.

The primary recommended turning method for RF cabling	
The second recommended RF wiring turning method	
A poor way to turn RF cables, not recommended	

In order to ensure that the impedance of the backplane RF trace is50Ohms, depending on the thickness of the board, Adjust according to the following parameters. the following2laminate imitation True value, for reference only.

RF wiring adopts 20mil Line width	The plate thickness is 1.0mm When , the spacing between ground copper and traces is 5.3mil
	The plate thickness is 1.2mm When , the spacing between ground copper and traces is 5.1mil
	The plate thickness is 1.6mm When , the spacing between ground copper and traces is 5mil
RF wiring adopts 25mil Line width	The plate thickness is 1.0mm When , the spacing between ground copper and traces is 6.3mil
	The plate thickness is 1.2mm When , the spacing between ground copper and traces is 6mil
	The plate thickness is 1.6mm When , the spacing between ground copper and traces is 5.7mil
RF wiring adopts 30mil Line width	The plate thickness is 1.0mm When , the spacing between ground copper and traces is 7.6mil
	The plate thickness is 1.2mm When , the spacing between ground copper and traces is 7.1mil
	The plate thickness is 1.6mm When , the spacing between ground copper and traces is 6.6mil

5.3.2 Built-in antenna

The built-in antenna refers to the one welded on PCB The antenna placed inside the product shell on the base plate specifically includes patch ceramic antennas, spring antennas, etc. within use When setting up the antenna, The structure of the product and the installation position of the antenna have a great impact on the radio frequency performance. On the premise that the product housing structure space is sufficient, the spring antenna should be Place the antenna vertically upward; copper cannot be laid around the base plate where the antenna is placed, or the circuit board under the antenna can be hollowed out, because metal affects radio frequency signals .The absorption and shielding capabilities are very strong, It will seriously affect the communication distance. In addition, the antenna should be placed on the edge of the base plate as much as possible.

5.3.3 external antenna

External antenna means the module passes IPEX Extension cable, SMA and other standard radio frequency interfaces installed outside the product shell, including rod antennas, absorbers Dish antenna, fiberglass antenna, etc. External antennas are basically standard products. In order to better choose an antenna suitable for the module, during the antenna selection process,Line parameter selection, The following should be noted:

1. The working frequency of the antenna and the working frequency of the corresponding module should be consistent.

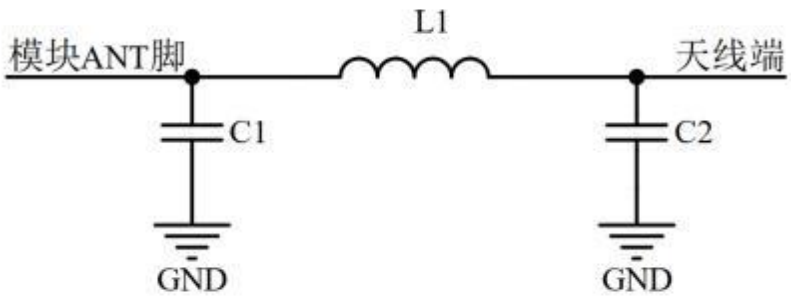
2. The input characteristic impedance of the antenna should be 50ohm.

3. The size of the antenna interface should match the size of the antenna interface of the module.

4. The standing wave ratio (VSWR) of the antenna is recommended to be less than 2, and the antenna should have a suitable frequency bandwidth (covering the frequencies used in the actual application of specific products).

5.3.4Antenna matching

Antennas are critical to the transmission distance of RF modules. In practical applications, it is to facilitate users' later antenna matching adjustments. It is recommended that users design schematics When the antenna and moduleANTA simple π-type matching circuit is reserved between the pin outputs. If the antenna is already standard 50Ω,ComponentsL1 stick0R resistance, deviceC1,C2 No welding is required, otherwise you need to use a network analyzer to measure the actual impedance of the antenna and match it to determineC1,L1,C2 The value of . module ANT The trace from the pin to the antenna end should be as short as possible. It is recommended that the longest trace length does not exceed 20mm.

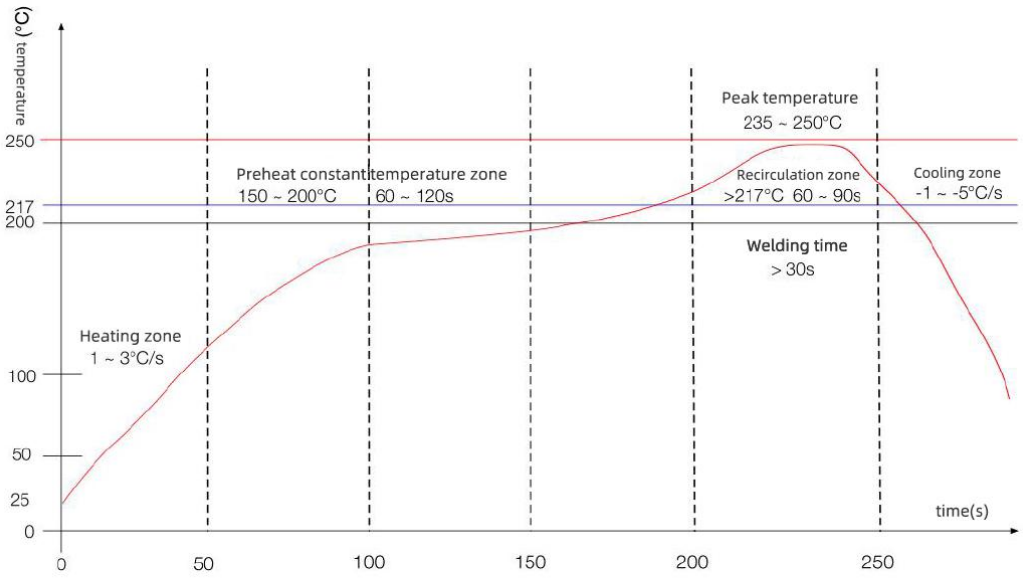


5-2 π type matching circuit

6. Precautions for programming development

Generally speaking, The receiving sensitivity of the RF chip is relatively poor at the operating frequency point that is an integer multiple of its crystal oscillator. It is recommended that users pay attention when selecting the operating frequency point.It is necessary to avoid the image frequency point of the module crystal oscillator, that is, the integer multiple frequency point of the crystal oscillator frequency. The crystal oscillator frequency of this module is 32MHz.

7. Reflow soldering curve



Heating zone-temperature: 25-150℃ time: 60-90s Ramp rate: 1-3℃/s
Preheat constant temperature zone-temperature: 150-200℃ time: 60-120s
Reflow soldering area-temperature >217℃ time: 60-90s; Peak temperature: 235-250℃ time: 30-70s
Cooling zone-temperature:Peak temperature -25-150℃ Cooling slope -1--5℃/s
Solder-tin-silver-copper alloy lead-free solder(SAC305)

8. Static electricity damage warning

The RF module is a high-voltage electrostatic sensitive device. In order to prevent static electricity from damaging the module

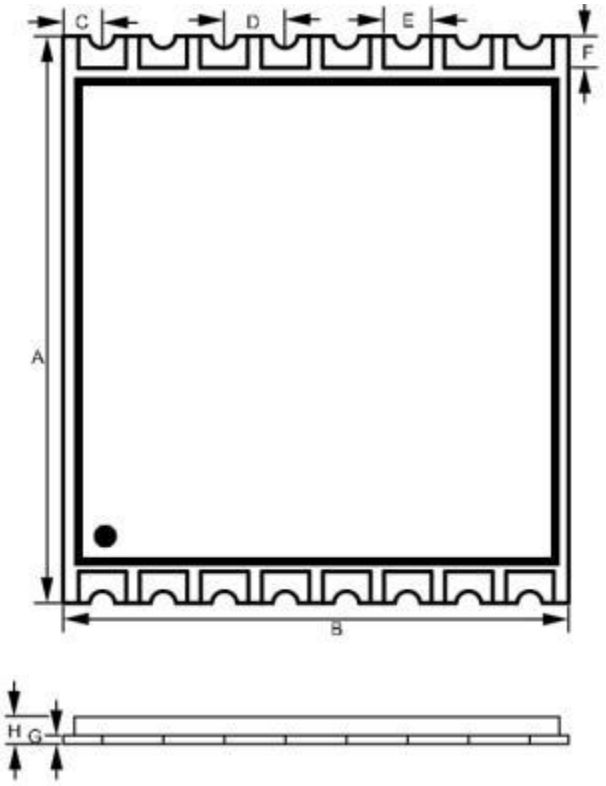
1,Anti-static measures are strictly followed, and bare hands are prohibited from touching the module during the production process.

2,Modules should be placed in a placement area that prevents static electricity.

3. The anti-static protection circuit at the high-voltage input should be considered during product design .

9. Packaging information

Mechanical dimensions (unit: mm)



serial number	Dimensions(mm)	Error(mm)
A	13.5	±0.5
B	12.0	±0.5
C	0.9	±0.1
D	1.45	±0.1
E	1.0	±0.1
F	0.6	±0.1
G	0.8	±0.1
H	2.2	±0.2

10. Version update instructions

Version	update content	Updated
V1.0	initial release version	2023 Year 10 moon 10th

11. Procurement selection table

number	model	illustrate
1	VG4130S433N0S1	433MHz frequency band, Tape packaging\pallet packaging
2	VG4130S490N0S1	490MHz frequency band, Tape packaging\pallet packaging
3	VG4130S868N0S1	868MHz frequency band, Tape packaging\pallet packaging
4	VG4130S915N0S1	915MHz frequency band, Tape packaging\pallet packaging

12. Statement

1. Due to product version upgrades or other reasons, the content of this document will be updated from time to time. Unless otherwise agreed, this document is only used as a guide.

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2. The company reserves the right of final interpretation and modification of all information provided, and any changes will be made without prior notice.

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